Contents

Contributors xiii
Preface xxi

Respiratory Rhythm Generation

Neural organization and rhythm generation
Curt von Euler 3

Organization of the neural mechanisms for generation of respiratory rhythm in the brain stem
Takehiko Hukuhara, Jr. 11

Chemosensitivity of medullary neurons in tissue cultures
Judith A. Neubauer, W. Chou, S. Gonsalves, G. Sterbenz, H.M. Geller and N.H. Edelman 19

Central chemosensitivity
Marianne E. Schlaefke 27

Locations of central chemoreceptors
Hideho Arita and Hajime Yamabayashi 35

Coupling between respiratory and stepping rhythms during locomotion
Yoshimi Miyamoto, K. Kawahara and Y. Nakazono 43

Spinal generation of respiratory rhythm: a study in an *in vitro* brainstem-spinal cord preparation of new-born rat
Mamoru Aoki and A. Mizuguchi 51

Poster Presentations

The role of a putative excitatory amino acid transmitter in the generation of respiratory rhythm in medulla isolated from new-born rat
H. Onimaru, A. Arata and I. Homma 57

GABA-Mediated inhibitory mechanisms in control of respiratory rhythm
A. Haji, R. Takeda and J.E. Remmers 61

Respiratory pattern generation in the ventral respiratory group neurons
R. Takeda, A. Haji, J.E. Remmers and T. Hukuhara 65

Correlation of inspiratory unit activity in the brain stem with phrenic high-frequency oscillation in rabbits
K. Takano, F. Kato, N. Kimura and T. Hukuhara, Jr. 69

Effects of localized cooling of the ventral medullary surface (VMS) on expiratory muscle activity
T. Chonan, S. Okabe, W. Hilda, T. Izumiyama, M. Satoh, M. Sakurai, Y. Kikuchi, N. Iwase, O. Taguchi, H. Miki and T. Takishima 73

Differential respiratory effects of HCO_3 and CO_2 applied on the ventral medullary surface of the rat
H. Tojima, T. Kuriyama and Y. Fukuda 77

Stereotyped phrenic responses to mechanical stimulation of the epiglottal mucosa
Y. Sakai and T. Hukuhara, Jr. 81

Hypoxic ventilatory response during recovery period from sustained hypoxia
M. Sato, S. Kagawa, M. Kamide, Y. Tanifuji and K. Kobayshi 85

Ventilatory response to pseudorandom work rate exercise in man
S. Usui, Y. Fukuba, M. Munaka, T. Tsuji, K. Iwanaga, T. Koba and S. Koga 89

A dynamical analysis of the respiratory system by the optimal principle
H. Hirayama, T. Kobayashi and H. Yasuda 93

Abnormality of Respiratory Control

Possible role of the awake ventilatory chemosensitivity in sleep-disordered breathing
Yoshiyuki Honda 99

Ventilation, chemosensitivity and ventilatory load compensation during sleep
Clifford W. Zwillich, Laurel Wiegand and Kevin Gleeson 107

Treatment of obstructive sleep apnea with airflow demand-type submental stimulator
Wataru Hida, Hiroshi Miki, Yoshihiro Kikuchi, Tatsuya Chonan and Tamotsu Takishima 113

Alteration of ventilatory pattern and ventilatory responsiveness to CO_2 with growth and aging in the rat
Yasuichiro Fukuda 119

Poster Presentations

Vulnerability of the respiratory system: disposition for sudden infant death syndrome?
T. Schaefer and M.E. Schlaefke 127

Effect of halothane on hypoxic and hypercapnic ventilatory responses of goats
S.O. Koh and J.W. Severinghaus 131

The primary analysis of breathing pattern in elderly people
J.-Y. Ma 135

Respiratory-like slow wave sympathetic oscillations during morphine-induced central apnea in rabbits
N. Kimura, F. Kato, Y. Tsukamoto and T. Hukuhara, Jr. 139

The genesis of gasps provoked by brain ischemia in the rabbit
S. Matsumoto, T. Shimizu, T. Kanno, M. Yamasaki and T. Nagayama 143

Carotid chemoreceptor discharge in the rat
R. Maruyama and Y. Fukuda 147

Effect of sudden withdrawal of respiratory CO_2 oscillation on the phrenic nerve activity
E. Takahashi, I. Tateishi and T. Mikami 151

Effect of vagal nerve cooling on hypercapnic and hypoxic ventilatory responses in anesthetized dogs
Y. Sagara, K. Koike, T. Nakada and S. Fujimura 155

Abnormalities of vagal reflexes in asthmatic rabbits
M. Sibuya, A. Kanamaru, M.B. Sibuya and I. Homma 159

Vagal afferents augmented respiratory reflex facilitation induced by muscle nociceptive inputs
D.G. Simbulan, Jr., E. Tadaki, Y. Kozaki, K. Eguchi and T. Kumazawa 163

Endogenous opioid-mediated respiratory modulations induced by nociceptive muscular afferents
T. Kumazawa, E. Tadaki, Y. Kozaki, D. Simbulan, K. Eguchi and T. Hirano 167

Positive pressure ventilation reverses phasic respiratory glottis narrowing in anesthetized dogs
S. Sakurai, H. Toga, J. Huang, Y. Nagasaka and N. Ohya 171

The long term follow-up of respiratory chemosensitivity in COPD families
M. Yamamoto, M. Nishimura, A. Yoshioka, Y. Akiyama, F. Kishi and Y. Kawakami 175

Breathing of hyperventilation syndrome patients at rest, the hyperventilation stage and the posthyperventilation stage
K. Chin, M. Ohi and K. Kuno 179

Effect of theophylline on brain tissue oxygenation and acid-base status in patients with COPD
M. Nishimura, A. Suzuki, T. Hiraga, A. Yoshioka, F. Kishi and Y. Kawakami 183

Factors responsible for a wide variation in $PaCO_2$ in patients with chronic obstructive pulmonary disease
Y. Akiyama, M. Nishimura, M. Yamamoto, F. Kishi and Y. Kawakami 187

New disease with ankyloglossia, dislocation of the epiglottis and of the larynx — dyspnea of newborn and suckling infants
S. Mukai and C. Mukai 191

Analysis of dyspnea episodes in children with obstructive sleep dyspnea
K. Togawa, S. Miyazaki, K. Yamakawa, H. Tada, Y. Itasaka and M. Okawa 195

Sleep disturbance and decreased vagal tone in respiratory and cardiovascular disorders
M. Adachi, Y. Ichimaru, Y. Sato and T. Yanaga 199

Changes of respiratory variables in sleep apnea syndrome
Y. Inoue, K. Ueda, T. Tamura and H. Hazama 203

Measurement of the pharyngeal area in patients with obstructive sleep apnea (OSA) during sleep using acoustic reflection technique
H. Shen, J. Huang, S. Kitagawa, K. Yamanouchi, S. Sakurai, H. Toga, T. Fukunaga, Y. Nagasaka and N. Ohya 207

Load compensation to postural change in patients with obstructive sleep apnea
M. Satoh, T. Chonan, W. Hida, S. Okabe, H. Miki, O. Taguchi, Y. Kikuchi, N. Iwase, C. Miura and T. Takishima 211

Genioglossus and inspiratory pump muscle activity during hypoxia, hypercapnia and sleep in patients with obstructive sleep apnea
S. Okabe, T. Chonan, W. Hida, M. Satoh, O. Taguchi, Y. Kikuchi, H. Miki, N. Iwase and T. Takishima 215

Respiratory Muscles and Dyspnea

Involvement of sensory and motor cortex in human respiratory control
S.C. Gandevia 221

Mechanoreceptors and respiratory sensation
Ikuo Homma, Arata Kanamaru and Masato Sibuya 229

Chest wall mechanisms in respiratory sensation
Murray D. Altose 235

Dyspnea sensation during dead space breathing
Yoshihiro Kikuchi, H. Miki, O. Taguchi, C. Shindoh, W. Hida, T. Chonan, M. Satoh, S. Okabe and T. Takishima 243

Effect of expiratory muscle fatigue on sense of effort during expiratory loading
Shunsuke Suzuki, J. Suzuki, T. Ishii and T. Okubo 251

Chest wall distortion and dyspnea
Katsuki Yoshino and Kimio Konno 259

Poster Presentations

Phrenic nerve stimulation in myasthenia gravis
A. Mier 269

Concurrent depression of respiratory and antigravity muscle activities by stimulation of the pontine dorsal tegmentum in decerebrate cats
K. Kawahara, Y. Nakazono, Y. Yamauchi and Y. Miyamoto 271

Nasal receptors responding to temperature and pressure changes in the nose
H. Tsubóne 275

Reflex activities of upper airway muscles during nasal occlusion in anaesthetized dogs
O. Kaminuma and H. Tsubone 279

Dilator nares activity in relation to obstructive sleep apnea
K. Asakura, Y. Nakano, T. Shintani and A. Kataura 283

Different course in the phase-related fluctuation of the high-frequency oscillation in the phrenic and cranial nerve activities in rabbits
F. Kato, K. Takano, Y. Tsukamoto, N. Kimura and T. Hukuhara, Jr. 287

Different effects of halothane and enflurane on diaphragmatic contractility *in vivo*
T. Kochi, T. Ide, S. Isono, T. Mizuguchi and T. Nishino 291

Diaphragmatic shortening during vomiting
T. Abe, S. Hua, H. Sato, N. Kusuhara, M. Tanaka and T. Tomita 295

Activity of the respiratory muscles during cough
I. Kobayashi, T. Kondo, H. Suzuki, Y. Ohta and H. Yamabayashi 299

A case of neuroleptics-induced respiratory dyskinesia
K. Honda, N. Yaginuma, R. Horikoshi, Y. Kaneko, M. Kaneko and H. Kumashiro 303

Breath-holding sensation — respiratory muscle activity and breathlessness sensation
K. Fujieda, S. Okubo, H. Morinari and M. Harasawa 307

Dyspnea and inspiratory muscle fatigue during exercise in patients with chronic obstructive pulmonary disease
H. Matsushita, S. Fujimoto, N. Kurihara and T. Takeda 311

Behavioural Control of Breathing and Dyspnea

Breathing versatility
Jere Mead 317

Cellular basis of behavioral control of breathing
J.M. Orem and Thomas E. Dick 321

Genetic influences on personality, thresholds for added resistance and dyspnea sensation
Yoshikazu Kawakami, Masaharu Nishimura, Shuichi Kobayashi and Yasushi Akiyama 329

Optimization of breathing through perceptual mechanisms
Neil S. Cherniack, Y. Oku, G.M. Saidel, E.N. Bruce and M.D. Altose 337

Poster Presentations

Ventilatory response and breathlessness in deliberate entrainment of breathing and pedaling cycles during cycle exercise
N. Takano 347

Effects of hypoxia on ventilatory response at the onset of bicycle exercise
M. Miyamura, L. Xi, K. Ishida, F. Schena and P. Cerretelli 351

PGE_2 inhalation increased dyspnea during exercise in normal subjects
O. Taguchi, Y. Kikuchi, W. Hida, N. Iwase, M. Satoh, S. Okabe, T. Chonan and T. Takishima 355

Effects of vagal afferent stimulation on high-frequency oscillation in phrenic nerve activity of rabbits
T. Hukuhara, Jr., W.-J. Yuan, K. Takano, F. Kato and N. Kimura 359

EMG biofeedback training of painful respiratory muscles in patients with dyspnea
I. Saito, Y. Saito and K. Takaoka 363

The effect of abdominal rectal massage in subjects with functional dyspnea and chronic obstructive and restrictive lung diseases
I. Saito, Y. Saito and K. Takaoka 367

Is a new demand valve oxygen regulator useful for patients with home oxygen therapy?
K. Machida, N. Nagayama, Y. Kawabe, Y. Otsuka, T. Haga and Y. Honda 371

Subject Index 375